Space Weather Forecast

Issued on Tuesday 24 December 2024 at 13:23 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Further Minor/Moderate radio blackouts expected. G1-G2/Minor-Moderate Geomagnetic Storms likely 25-26 Dec.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Moderate with several Moderate-class flares observed from the cluster of sunspot regions located in the southeast quadrant.

There are now thirteen sunspot regions on the visible disc, with the addition of an unnumbered region in the far northeast. This region may well reveal more complexity as it rotates further into view. The southeast quadrant remains the focus of solar activity, containing a cluster of the three largest regions (AR3928, AR3932 and AR3933). Elsewhere, in the northeast, AR3936 also saw growth in its main trailing spot. Other remaining regions are more magnetically simple and generally unchanged.

A moderately-fast Coronal Mass Ejection (CME) associated with a Moderate solar flare and sympathetic filament (Arc of the Sun's plasma) eruption was modelled as an expected flanking impact on 25 Dec, or perhaps early 26 Dec. Analysis continues into two CMEs associated with two recent Moderate flares from sunspot region AR3932 in the southeast.

Solar Wind / Geomagnetic Activity: Solar winds were elevated to strong, varying between around 520-630km/s. The Interplanetary Magnetic Field (IMF), Bt, was weak. The north-south component, Bz, varied weakly throughout, with no single direction predominant. Geomagnetic activity was Quiet to Unsettled (Kp1-3).

Energetic Particles / Solar Radiation: High energy proton flux was well below the S1/Minor Storm threshold, but slightly elevated above normal background levels, on a slowly declining trend.

Four-Day Space Weather Forecast Summary

Solar Activity: Further Moderate flares are likely, with a slight chance of isolated Strong flares maintained throughout.

Solar Wind / Geomagnetic Activity: A Coronal Mass Ejection (CME) that left the Sun late 20 Dec has a now reducing chance to give Earth a glancing impact early on Day 1 (24 Dec). A moderately-fast CME on 23 Dec from a flare and subsequent filament eruption in the southeast disc is

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expected to result in a flanking impact on Day 2 (25 Dec), or perhaps arriving early Day 3 (26 Dec). No other potential Earth-directed CMEs feature in the forecast, however, due to the sheer number of CMEs in evidence in solar imagery over the past several days, confidence in this aspect of the forecast is lower than usual.

An ongoing solar wind enhancement, giving elevated wind speeds, is expected to continue until Day 2 (25 Dec) before slowly declining. Further connection to faster solar winds is possible from Day 3 (26 Dec) onwards, but considered unlikely.

Geomagnetic activity is expected to be mainly Quite to Unsettled on Day 1 (24 Dec) with a chance of Active intervals. On Day 2 and 3 (25 and 26 Dec), dependent on any CME arrival, peak G1-G2/Minor-Moderate Storm levels are likely. By Day 4 (27 Dec), mainly Quiet to Unsettled activity is forecast, but with a chance of Active periods, especially at first.

Energetic Particles / Solar Radiation: There is a slight chance of Solar Radiation storms occurring during the period. In the absence of any further notable flares, ongoing slightly enhanced Solar Radiation counts should ease towards normal background levels in the coming days.

Geomagnetic Storms

Geomagnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	10	70	70	10
Strong	G3	No	1	10	10	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X-Ray Flares

X-Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 (M Class)	Yes	80	80	80	80
Very Active	R3-R5 (X Class)	No	10	10	10	10

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Solar Radiation Storms (High Energy Protons)

Radiation Storms Probability (Exceedance)	Level ($cm^{-2}sr^{-1}s^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	20	20	20	20
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and/or 50 MeV ≥ 10pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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